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**

WATER QUALITY AND QUANTITY SURVEY

HIGHWAY 17 EAST
TOWN OF NICKEL CENTRE

1980

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HIGHWAY 17 EAST

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1980

Prepared by:

Northeastern Region
Ministry of the Environment
Sudbury, Ontario

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Introduction:

At the request of the Regional Municipality of Sudbury Council (Resolution #79-662), a water quality and quantity survey was undertaken of a residential strip development along Highway 17 East in the Town of Nickel Centre. The investigative part of the survey was initiated in September 1979, in response to a well water gasoline contamination complaint and completed during December 1979, by Sudbury District office staff. The extent of the gasoline contamination, and water quality and quantity problems at the ten private residences, the gas bar, and Inter-City Truck Line Transport wells were addressed.

During the investigation, all the locations were visited, and bacteriological, chemical, gasoline and phenolic samples of their drinking water were collected for analysis.

Location:

The study area is located 1/4 km east of the City of Sudbury limits within the Town of Nickel Centre. It encompasses a 1/2 km strip of residential development along Highway 17 East. All the dwellings in the area are residential except for the gas bar and a transport company.

This area is an unserviced area (City of Sudbury water pipeline on south side of highway) situated between serviced areas in the City of Sudbury (4 kilometers west) and the community of Coniston (3 kilometers east). A service station, a motel and three residences scattered along Highway 17 East towards Coniston were not included in the survey. The study area is shown in Appendix A.

Topography and Physiography

The strip development is confined by a steep hill at the north and by Highway 17 East on the front or south side. The soil make-up along the strip development is mostly a sandy-clay material with numerous rock outcroppings.

Surface drainage flows from the hill at the back of the property, into the Highway 17 East ditch at the front, crossing the highway and flowing into Romford Creek. Temporary flooding of the sewage disposal systems and dug wells (buried and not properly sealed) may occur during heavy precipitation and spring runoff periods. It was noted that some of the drainage does pond between driveway culverts.

Survey Procedure

Each of the tenants and/or owners were interviewed concerning their sewage and water works. Appendix B is a sample of the questionnaire used. The lots were sketched to show the relative location of the wells and sewage disposal systems.

Samples were collected at each location for bacteriological, chemical, gasoline and phenolic analysis. The samples taken for bacteriological analysis were forwarded to the Ministry of Health laboratories. Samples for the other parameters were sent to the Ministry of the Environment laboratories in Toronto and analysed for pH, sodium, alkalinity, colour, iron, manganese, chlorides, nitrates, conductivity, sulphate, kjeldahl nitrogen, gasoline, and phenols.

Survey Findings

i) Sewage Disposal

Appendix C summarizes the type and age of sewage disposal systems reported by the owner or tenant.

Of the 12 locations, 10 had a septic tank and tile bed system while one resident had a holding tank, and the other had a humus toilet and a seepage tank (installed 25 years ago).

Systems ranged in age from 8 years to greater than 30 years. The majority of them were greater than 15 years of age. The age of three systems could not be determined but it was estimated, based on the age of the homes, that the systems were more than 15 years of age. The Inter-City Truck Line septic system was installed about 23 years ago.

The Highway 17 East gas bar system was inspected by the Sudbury and District Health Unit staff during 1979 who recommended that the sewage system be upgraded. The 10 septic tank/tile bed systems were not sufficiently evaluated to determine if problems do exist; however, based on the age of the systems, the potential does exist that sufficient treatment may not be provided (sewage disposal evaluation could not be completed during winter conditions).

ii) Water Supplies

Appendix D summarizes the type and the age of the water supply systems.

Nine of the 10 private residences have a private water supply system, with one resident being supplied by a neighbor's well. The Highway 17 East gas bar and Inter-City Truck Lines properties have individual wells. Of these 11 wells, there were 8 dug wells and 3 drilled wells.

All wells were at least 8 years of age with the majority of them being over 15 years old.

Owners/residents comments are summarized in Appendix E. Eleven of the 12 locations had either taste and odour, hardness, or iron and manganese water problems. Quantity problems were reported by two residents. Five of the 12 are not consuming the well water due to the poor quality and are bringing in water for drinking and cooking purposes. Water treatment systems are being used at six of the residences (softeners/sediment filters/ activated carbon filters). No chlorinators are in use.

Discussion of Water Supply Sample Results

Appendix F summarizes the results of the chemical and bacterial analysis of the drinking water samples.

i) Bacterial Quality

Results of the bacteriological analysis of drinking water supplies (samples collected in September 1979) indicate that 4 well supply systems had problems. The samples of 2 water supply systems showed the presence of total coliforms and 2 other supplies showed the presence of both total and fecal coliforms. Resampling of the systems on December 10, 1979 indicated that the systems were no longer contaminated. The bacterial quality problem was resolved for two of the individual wells by disinfection of the supplies while the two other wells appeared to have improved naturally, possibly because of the frozen ground and the cold temperatures.

ii) Nitrates

Nitrate levels exceeded the 10 mg/L as N maximum limit for drinking water in two of the water supplies. (10 mg/L as N is the maximum acceptable concentration for infant feeding).

iii) Sodium

Sodium, a constituent of common salt, may aggravate conditions of hypertension or conjunctive heart failure. Although no official limits exist, the Ministry of the Environment notifies residents and the Sudbury and District Health Unit of all water supplies which have sodium levels that exceed 20 mg/L. In the study area, five of the residences' wells and the Inter-City Truck Lines Limited well were found to have sodium levels in excess of this amount due to road salting and septic system contamination.

iv) Iron and Manganese

Iron and manganese concentrations greater than 0.3 mg/L and 0.05 mg/L respectively may contribute to taste problems and cause staining of plumbing fixtures. The iron and manganese limits were exceeded at six and nine well water supplies respectively.

v) Colour and Turbidity Levels

Colour and turbidity levels affect the water's appearance. Elevated colour and turbidity levels are usually associated with the presence of iron and manganese. Throughout the area, it was found that eight residents' wells had water that exceeded the recommended limits for both colour and turbidity.

vi) Chloride

Chloride concentrations exceeded the Ministry's criteria in one drinking water supply.

vii) Phenols (Gasoline)

Phenols above background levels were detected in three residential well water supplies surrounding the gas bar (natural groundwater background phenolic concentration less than 1 ug/L). These three high phenolic concentrations (range 9 - 140 ug/L) represent gasoline and/or petroleum-base product contamination in the groundwater system. The

gasoline source is suspected to be from a leaking gasoline tank and/or piping, and/or from accumulation of past spillage on the gas bar property. Soil samples confirm that the soil profile is contaminated with gasoline to a depth of 9 feet, in the vicinity of the gasoline tanks.

This gas bar is no longer used, the tanks/lines have been drained; however, the elevated levels of phenols could persist for an extended period of time. Additionally, there is some potential for the contamination zone to become more widespread, affecting more wells.

Two of the three gasoline-contaminated residential water supplies are being treated for gasoline and/or phenolic component removal by activated carbon filters. A filter was not installed on the third supply because the well water had elevated concentrations of sodium (100 mg/L), prohibiting the water being consumed (resident has a heart condition). The M.O.E. is paying for the rental and maintenance costs of these filters for an initial ten-month period.

These filters were installed as a temporary solution to quickly restore the water to a potable quality for the affected residences. However, concentrations of gasoline and/or phenolic components in combination with the existing elevated concentrations of iron and manganese will eventually "sour" the filters and hence, are not totally reliable on a continuous basis (requires an intensive maintenance and monitoring program). Therefore, it is the Ministry's opinion that activated carbon filters do not provide an acceptable long-term solution for these residences.

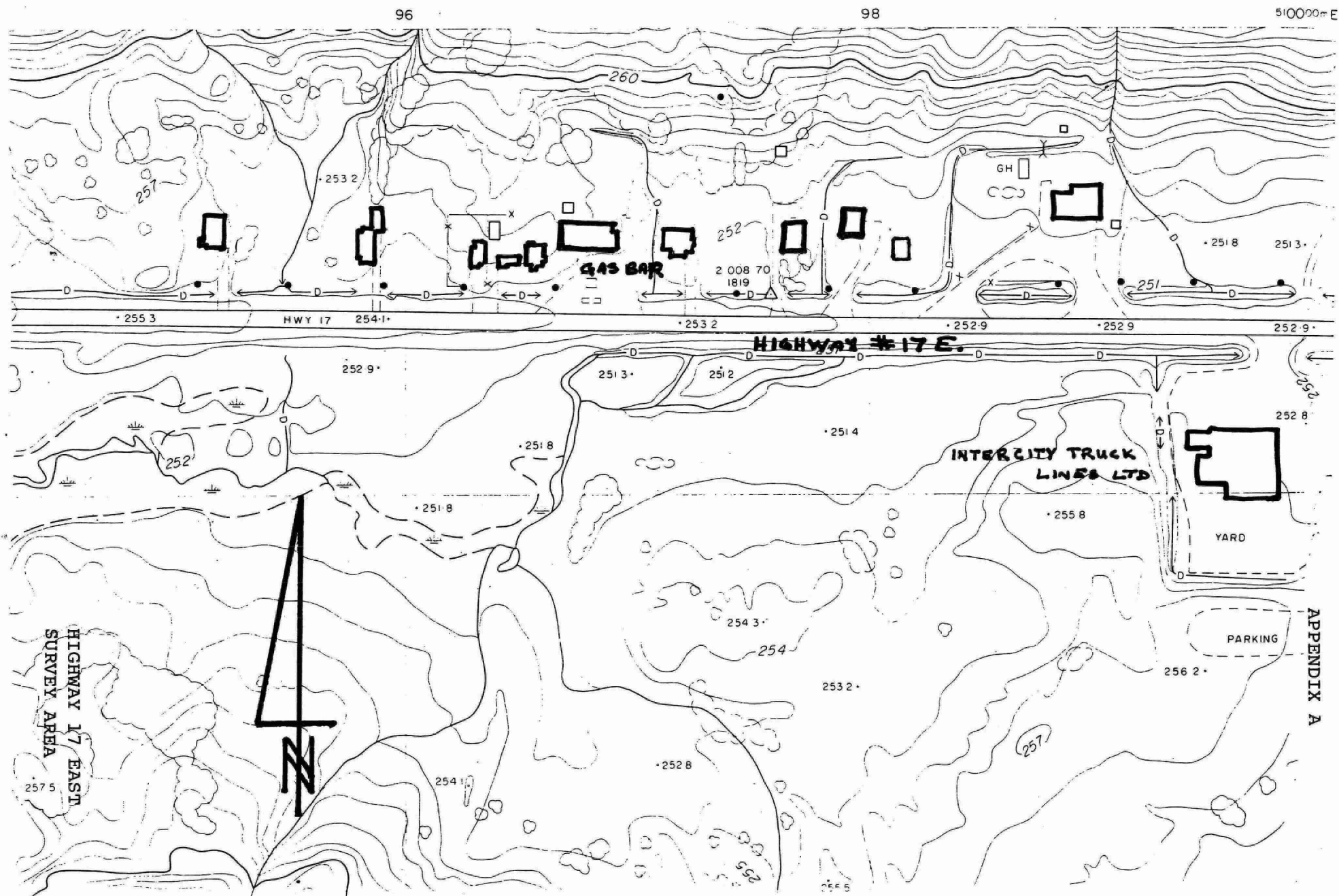
Conclusions

- 1) The groundwater regime of the strip development area has a poor existing natural water quality, and is being affected by highway salting during the winter months, the gasoline contamination and by faulty sewage systems.
- 2) Three residential well water supplies are contaminated by gasoline and/or it's phenolic component. Gasoline has seeped into the groundwater regime from the gasoline dispensing facilities and although the facilities are no longer in service, the contamination problem is expected to continue for an indefinite period. There is some potential that the contamination will spread, affecting further wells.
- 3) Nine of the twelve septic systems have been in use for more than 15 years and may not be providing the necessary degree of treatment. One septic system, a seepage system type, may be responsible for contaminating the owner's and a neighbor's well. The gas bar sewage system would have to be brought up to Sudbury and District Health Unit standards if the property were to be reactivated.
- 4) Eight of the eleven wells are a dug type and are more than 15 years old. These old dug-type wells are susceptible to bacterial and chemical contamination. During the initial survey, 4 well water supplies were found to be bacteriologically contaminated.

- 5) Well water is not being used for potable consumption at four of the residences, the gas bar and the transport company. One resident has started reusing the well water following the installation of an activated carbon filter.
- 6) Two of the residences reported water quantity problems.
- 7) Health-related well water problems were determined at seven (58%) of the residences (5 with elevated sodium concentrations, and 2 with elevated nitrate concentrations). The remaining residences have poor tasting water that gives off an odour.

Recommendations

- 1) Based on the available information including a history of poor water quality, surficial aquifer contamination and potential bedrock aquifer contamination, replacement of the affected supplies with new groundwater supplies is not recommended. It is recommended that the strip development be serviced from the adjacent City of Sudbury's water pipeline system.
- 2) The gas bar property should be further investigated to determine the magnitude and potential for spreading of the gasoline contamination as well as the degree of cleanup required.



SURVEY FORM

PRINT ALL INFORMATION

APPENDIX B

COMMUNITY: _____

INFORMATION RECEIVED FROM: _____

SURVEYED BY: _____

SAMPLE INFORMATION

| | | | | |
|-----------------|-----------------|--------|----------|--------|
| Type | Bacteriological | | Chemical | |
| Sample No. | | | | |
| Sample Location | | | | |
| Results | Total | Faecal | Total | Faecal |
| | | | | |

PROPERTY INFORMATION

Name of Owner _____ Owner's Phone No. _____
 Permanent Address _____

Name of Resident _____

| | | | | | |
|---------|----------|----------|-----------|----------------|-----------|
| Lot No. | Cont.No. | Township | Community | Street Address | Phone No. |
| | | | | | |

| | | | |
|-------------|----------|------------|-----------|
| Size of Lot | Drainage | Topography | Soil Type |
| | | | |

| | | | |
|------------------|-----------------|--------------------|-------|
| No. of Residents | No. of Bedrooms | Laundry Facilities | Other |
| | | | |

SEWAGE DISPOSAL SYSTEM

| | | | | |
|------|--|--------------|-----------|-----------------|
| Type | Septic Tank _____ Tile Bed _____ (enter distances) | Leaching Pit | Pit Privy | Other (Specify) |
| | | | | |

| | | |
|-----|---------------------------|--------------------------|
| Age | Distance to Surface Water | Distance to Water Supply |
| | | |

Comments: _____

| |
|---------------|
| Note Quantity |
| |

WATER SUPPLY

| | | | | | | | |
|-----------|---------------|------------------------------------|--------------|--------------|-------------|------------|---------|
| Type | Surface Water | Dug Well | Drilled Well | Cased Well | Point | | |
| | | | | | | | |
| Depth | Age | Type & Capacity of Pressure System | | Type of Pipe | Chlorinator | Filtration | |
| | | | | | | | |
| Comments: | Taste | Odour | Colour | Iron | Hardness | Quantity | Quality |
| | | | | | | | |

DIAGRAM ON REVERSE SIDE SHOWING LOCATION AND DISTANCES FOR WATER SUPPLY AND SEWAGE DISPOSAL

APPENDIX C

SEWAGE SYSTEM INFORMATION

12 Sewage Systems

| <u>TYPE</u> | <u>NUMBER</u> |
|--------------------------|---------------|
| Septic Tank & Tile Field | 10 |
| Pit Privy | 0 |
| Leaching Pit | 0 |
| Holding Tank | 1 |
| Proprietary System | 0 |
| Other | 1 |
| Shared Septic System | |

AGES IN YEARS

| | <u>NUMBER</u> |
|---------|---------------|
| 0 - 5 | 1 |
| 6 - 10 | 1 |
| 11 - 15 | 1 |
| 15 - 30 | 9 |

APPENDIX D

WATER SUPPLY SOURCE INFORMATION

Number of supply systems - 11

| <u>WATER SUPPLY</u> | <u>NUMBER</u> |
|---------------------|---------------|
| Dug Well | 8 |
| Drilled Well | 3 |
| Point Well | 0 |

AGES IN YEARS

| | <u>NUMBER</u> |
|---------|---------------|
| 0 - 5 | 1 |
| 6 - 10 | 1 |
| 11 - 15 | |
| 15 - 30 | 9 |

APPENDIX E

CONSUMER WATER SUPPLY COMPLAINTS

Number of Locations - 12

| <u>COMPLAINT</u> | <u>NUMBER</u> |
|-------------------------------|---------------|
| Taste & Odour | 8 |
| Iron and Manganese | 1 |
| Hardness | 2 |
| Quantity | 2 |
| Well Water not being Consumed | 5 |

| <u>TREATMENT SYSTEMS</u> | <u>NUMBER</u> |
|-------------------------------------|---------------|
| Water Softener | 1 |
| Sediment & Activated Carbon Filters | 5 |
| Chlorinators | 0 |

APPENDIX F

SAMPLE RESULTS EXCEEDING M.O.E. GUIDELINES

| | <u>NUMBER</u> | <u>MAXIMUM VALUES</u> |
|-----------|---------------|---------------------------|
| Iron | 6 | 5.5 mg/L |
| Chloride | 1 | 344 mg/L |
| Colour | 8 | 53 Hazen Units |
| Turbidity | 8 | 42 Formazin Units |
| Sodium* | 5 | 109 mg/L |
| Nitrate | 2 | 17 mg/L |
| Manganese | 9 | 2.0 mg/L |
| Phenols | 3 | 140 ug/L |

M.O.E. GUIDELINES

| | |
|-----------|------------------|
| Nitrate | 10 mg/L |
| Iron | 0.3 mg/L |
| Chloride | 200 mg/L |
| Manganese | 0.05 mg/L |
| Colour | 5 Hazen Units |
| Turbidity | 1 Formazin Units |
| Phenols | 1 ug/L |

* Sodium 20 mg/L (Notification Level Only)

BACTERIAL WATER QUALITY RESULTS

| | <u>Sept/79</u> | <u>Oct/79</u> | <u>Dec/79</u> |
|--|----------------|---------------|---------------|
| No. of Wells Sampled | 7 | 5 | 9 |
| No. of Wells Sampled with Total Coliform Counts | 3 | 3 | 0 |
| No. of Wells Sampled with Fecal Coliform Counts | 1 | 1 | 0 |



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